Laboratory and Bio/Life Sciences Subcommittee

Economic Development Advisory Board

Brookline, Massachusetts

OCTOBER 4, 2021

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EXECUTIVE SUMMARY

The Boston metropolitan area is among the world's leaders in life sciences. Institutions and corporations in the Boston area continue to lead the nation in governmental (NIH), private venture capital, and public capital market funding. This strong flow of funds, which is projected to strengthen and continue, is driving a robust market in laboratory/life science space: 24.4 million square feet of existing space[1], a vacancy rate of 3.7%[2], 4.0 million square feet of new space under construction, and an additional 20 million square feet of proposed developments.[3] While Kendall Square remains the epicenter of the life science industry, the market for life science space has spread to the Seaport, Watertown, Allston, as well as the Fenway and Newton.

Brookline, due to its location near the Longwood Medical Area ("LMA"), its access to public transportation, amenities, and highly educated residents, is well positioned to participate in the future growth of the life sciences market. The opportunities to realize that potential, however, are currently limited given the Town's lack of appropriate zoning and health/safety oversight framework, and the small number of locations in Brookline of appropriate size to host significant laboratory/life sciences development.

It is within this context that in February 2021 the Economic Development Advisory Board (EDAB) established a Laboratory and Bio/Life Sciences Subcommittee (the Subcommittee) to study this property type and develop recommendations regarding this use as part of the Town of Brookline's economic development strategy.

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[1] LIFE SCIENCES ON THE RISE, NORTH AMERICA, by Cushman & Wakefield, page 20.

[2] LIFE SCIENCES ON THE RISE, NORTH AMERICA, by Cushman & Wakefield, page 20.

[3] LIFE SCIENCES MARKET REPORT/FIRST QUARTER 2021, GREATER BOSTON, Avison Young, page 1.

This report is directed to the Select Board and Town Administrator. This report includes an implementation plan for its recommendations, which will involve the Advisory Committee and Planning Board, who are accordingly copied along with senior Town staff.

FINDINGS

The Subcommittee's key findings, discussed more fully in the following sections of this report, are as follows:

I. Opportunities do exist at a limited number of locations in Brookline for the development of laboratory/life science space.
II. Potential laboratory/life science developments would have a positive net impact on the Town of Brookline's financial position.
III. Laboratory/life science developments can support and strengthen the Town's retail, restaurant and hospitality, and commercial business communities.
IV. Based on our recommended public health regulatory concepts, potential laboratory/life science developments would not pose a material risk to the public's health and safety.
V. The following are the specific steps necessary, along with a recommended time frame for their execution, for the Town to make Brookline "laboratory/life science ready" in order to realize these development opportunities.

    a. Establishment of new zoning provisions allowing for Research and Development Laboratory uses, including but not limited to a broad range of biotechnology, medical, engineering, scientific, technology, and similar "21st century industries." (Fall 2022 Town Meeting.) These newly defined uses would be allowed by special permit in major commercial corridors in Brookline. Due to dimensional limitations under present zoning, modified zoning provisions would likely be needed to be adopted by Town Meeting for any such development or redevelopment to proceed. We recommend the Select Board direct the Town Administrator, Town Counsel's office and the Planning Department to put

forward a warrant article in the fall of 2022, incorporating the zoning provisions outlined in this report.

b. Those laboratory facilities that constitute microbiological and biomedical laboratories would be limited to Biosafety Levels 1 and 2 as defined by the CDC, [4] a position supported by Brookline's Director of Public Health, Dr. Swannie Jett.
c. Establishment, under a new Brookline general by-law (Fall 2022 Town Meeting), of a framework for Town oversight, licensing, and monitoring of public health and safety aspects of life science laboratory operations. Such a by-law would include establishment of a Brookline Biosafety Advisory Council comprised of Town officials and community resident members with appropriate bioscience and medical expertise. We recommend the Select Board direct the Town Administrator, Town Counsel's office and the Department of Public Health to put forward a warrant article in the fall of 2022, incorporating the framework referenced in this report.
d. Impanel a 10 Brookline Place Study Committee by January 2022 to negotiate with the 10 Brookline Place site's owner parameters for the redevelopment of this property for laboratory uses.
e. Funding for a series of sequential corridor zoning studies, beginning in fiscal year 2023 starting with the Chestnut Hill West district, to identify site-specific zoning parameters needing modification to support development of research laboratory and other uses. This Subcommittee has identified the Chestnut Hill Office Park as a second potentially suitable research laboratory site.
f. Continuously pursue opportunities identified in the 2019 Major Parcel Study, with particular focus on large non-profit owned properties with commercial redevelopment potential.

SECTION 2: COMMITTEE CHARGE AND STUDY PROCESS

Established in February 2021 by the Economic Development Advisory Board, to investigate and evaluate the addition of Research and Development and/or Laboratory Life Science and other

[4] Biosafety In Microbiological and Biomedical Laboratories, 6th Edition, Centers for Disease Control.

related uses to the Brookline Zoning By-Law beyond the present GMR district at Brookline Place.

The Subcommittee's full charge, member biographies, and a full list of resources consulted by the Subcommittee can be found in Appendix 2.

SECTION 3: WHAT DO LIFE SCIENCE/RESEARCH AND DEVELOPMENT BUILDINGS LOOK LIKE?

Life Science and Research and Development facilities are hard to distinguish from other commercial developments when viewed from the street. From the exterior, they typically look like a modern office complex. Their most distinguishing feature is a large mechanical penthouse that can range from twenty up to thirty-five feet in height, which; because of setbacks from the building's edge, are typically not visible when looking-up from the ground. Their second distinguishing feature is a greater floor to ceiling height than a typical office building (about 15 feet versus 12 feet), which results in there being fewer floors for a given building height: not something the casual observer would notice.

In the Boston metro area, both life science and research and development properties are currently operating adjacent to residential developments and several life science projects in varying stages of the planning and construction process are components in larger mixed-use (residential and commercial) developments.

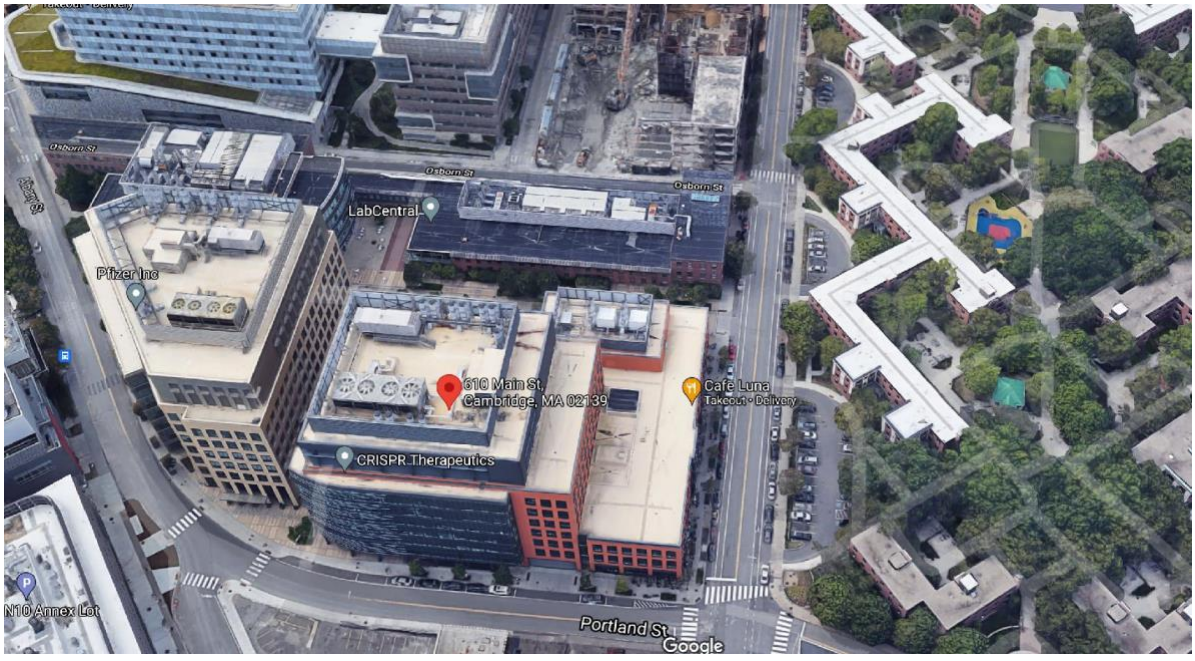
Following are selected examples of life science research and development facilities.

EXISTING LIFE SCIENCE/RESEARCH & DEVELOPMENT PROJECTS

OSBORNE TRIANGLE
610 & 700 Main Street, 1 Portland Street
Cambridge, MA

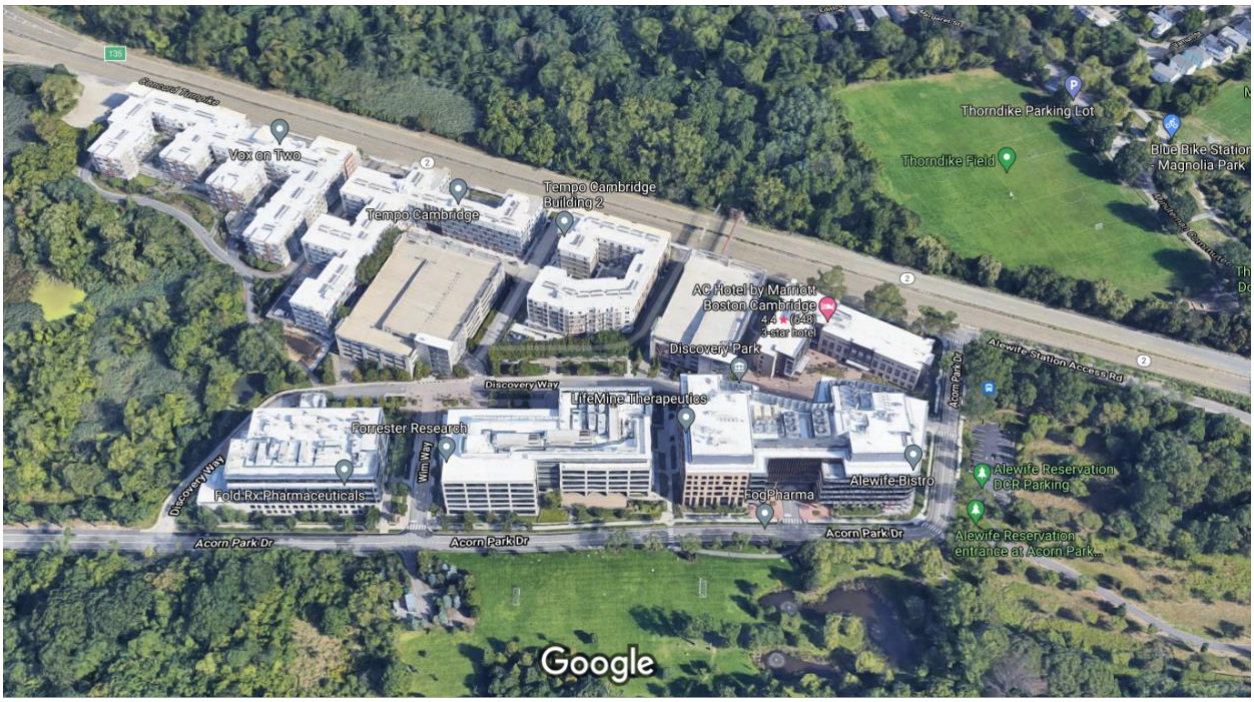
A laboratory/office property totaling +/-680,000 square foot. Anchor life science tenants include Pfizer, Novartis, and Lab Central. Located on the edge of Kendall Square, the property is directly across Main Street from the Newtowne Court housing complex.


610 MAIN STREET NORTH


Osborn St
LabCentral
Pfizer Inc
610 Main St,
Cambridge, MA 02139
Café Luna
Takeout · Delivery
CRISPR Therapeutics
N10 Annex Lot
Portland St
Google

CAMBRIDGE DISCOVERY PARK
20-100 Acorn Park Drive
Cambridge, MA

A 610,000 square foot laboratory/office property. Anchor life science tenants include Fog Pharma, Genocea Biosciences, and Senda Biosciences. Located close to the MBTA Alewife Redline stop, these three buildings abut a hotel and multiple residential buildings including Vox on Two and Tempo Cambridge.



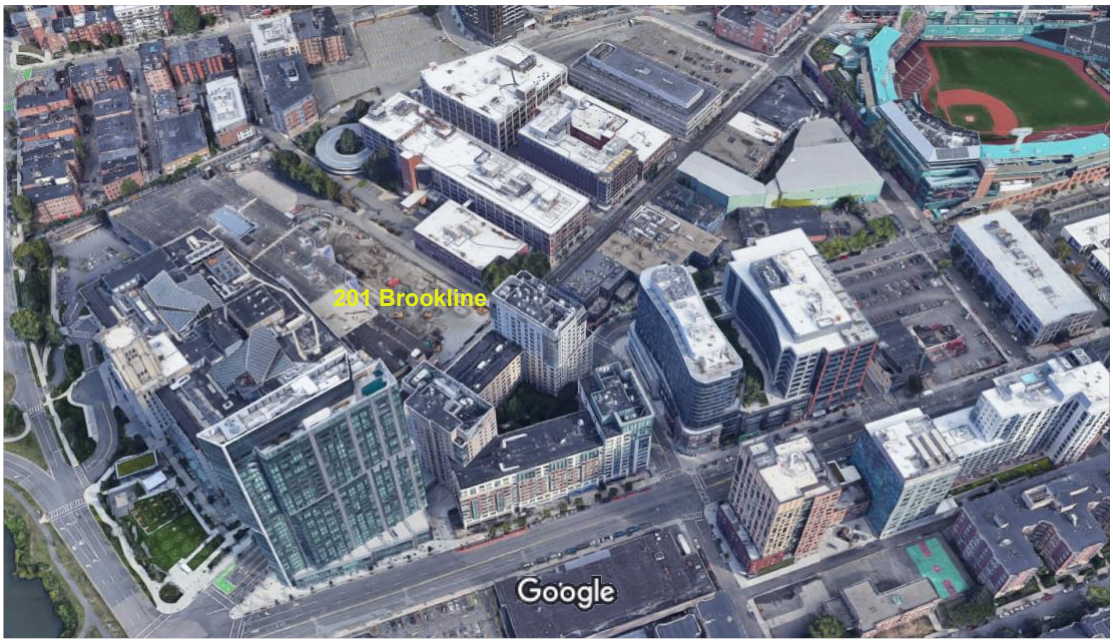
UNDER CONSTRUCTION

201 Brookline Ave (part of the Landmark Center redevelopment, site of the former Blick Art Store).

The 500,000+ square foot lab/office development has signed leases with Tango Therapeutics and Third Rock Ventures last year.

(see photo on the following page)

As shown on the following aerial photo, there is considerable residential development both in the immediate Fenway neighborhood and along Beacon Street.



275 Grove Street (part of the Riverside MBTA redevelopment)
Newton, MA

A million plus square foot mixed-use project to include 550 residential units, and 362,000 square feet of office/laboratory space.

INTERIOR SPACES

The interior of these facilities is frequently a mix of typical office space and dedicated research space. The ratio of office to lab space is a function of the type of research and in the case of industry (versus academic) users, the stage of development of the company's product. As a company's product gets closer to market the amount of office space relative to lab space typically increases.

As is discussed in Section 4 of this report, only certain types of tenants will require "wet lab" facilities, the design of which are highly delineated by government regulations and industry standards. Wet labs are for manipulating liquids, biological matter, and chemicals. Dry labs, which present as standard office space, are focused on computation, physics, and engineering. Below is an example of a wet lab interior at Cambridge Discovery Park.

SECTION 4: MARKET DISCUSSION

HISTORY OF LABORATORY LIFE SCIENCE USES IN BROOKLINE

In 2003 Town Meeting rejected a proposed zoning change for Two Brookline Place allowing a bio lab. A decade later, in 2013, Town Meeting did pass zoning changes permitting this use in the General Business and Medical Research (GMR) zoning district, as part of the redevelopment of Two Brookline Place. Under the current Brookline Zoning By-law, Two Brookline Place, occupying the GMR district, remains the only location in Brookline where research laboratory is

an expressly allowed use (subject to special permit)[5]. Children's Hospital's recently opened facility at this site, however, does not include life science research uses.

Despite the restrictions of current zoning, there is life science and research activity occurring in commercial and home offices throughout Brookline. This is primarily the intellectual thought processes and in-silico (computer based) research which underpins so much of current life science research. These offices are referred to as "dry labs", as opposed to prototyping, manufacturing, and "wet lab" research spaces.

OVERVIEW OF GREATER BOSTON LABORATORY/LIFE SCIENCES MARKET

Currently experiencing a boom in activity, the Boston market is expected to always be an attractive location for companies not only because of its established position, but also because of the combination of its world class educational institutions and medical facilities, highly qualified labor pool, overall quality of life and concentration of life science focused capital sources.

The Boston Metropolitan Area hosts one of the largest concentrations of public and private life science entities in the world and is the dominant market in the Eastern United States for life sciences related real estate development. Anchored by its world-class academic institutions, its consistently strong labor pool, and a well-recognized commitment to innovation, the metro area is expected to remain a leader in the life science field, domestically and world-wide.

[5] Article IV of the Zoning By-law, in Item 36B of the Principal Uses Table, allows "Research laboratory for scientific or medical research" at a BSL 1 or 2 level, in the GMR – 20 district, on a lot of no less than 50,000 sf and no more than 65,000 sf, subject to a special permit and an annual hazardous materials review supervised by the Fire Chief and the Director of Public Health and Human Services.

The size of the existing market is estimated at 24 to 26 million square feet[6]. Historically led by activity in Cambridge, particularly the Kendall Square market, the Boston metro area has experienced an activity boom in both urban and suburban sub-markets, driven both by the high cost of space in Cambridge and overall demand for space relative to existing supply. Boston's Seaport area houses the second largest biotech cluster with areas/municipalities including Boston's South End, South Boston, Watertown, Fenway, the Longwood Medical Area, Allston-Brighton, Newton, and Somerville, along with more established markets like Waltham and Lexington, competing to attract investors, developers, and tenants.

While historically driven by major medical and academic institutions, today the Greater Boston life sciences market is not monolithic with respect to either the type of user or the nature of how space is utilized.

Users:

a. Academic and medical center users include Massachusetts General Hospital (Harvard affiliated), Tufts Medical Center in Chinatown, Boston Medical Center (Boston University affiliated) and the Longwood Medical Area (LMA). The LMA hospitals include the Dana-Farber Cancer Center, Brigham & Women's Hospital, Children's Hospital, and the Beth Israel Deaconess Medical Center. Massachusetts, led by the Longwood Medical Area, has received more funding per capita than any other state for the past 26 years.[7]

b. Corporate users include businesses in the biotechnology, medical research, pharmaceutical, biochemistry, genetics and many other fields that fall under the broad heading of 'life sciences.' These entities include large established corporations as well as numerous, and growing, venture-backed companies ranging from start-ups/early stage to mid/late-stage operating entities.

   Typically, these entities require years of venture and/or private equity funding or corporate guarantees before they produce either revenue or profits, and stand on their

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[6] Cushman & Wakefield North American Report on Life Sciences, page 20, and Colliers Boston 21Q1 Lab report. Includes all Boston and Cambridge submarkets, excludes suburban markets that total roughly 6 million additional square feet.

[7] Boston Planning Department, http://www.bostonplans.org/getattachment/b4770f73-9eba-4320-ad6d-eca859825a35; Avison Young, First Quarter 2021 Life Sciences Report

own. Capital raising by life sciences focused venture and private equity investment vehicles has been and is expected to remain robust.

Uses:

Preconceived notions of life science buildings containing floor after floor of crowded lab stations, Bunsen burners and pipettes are outmoded. As noted in Section 3, these facilities contain a mix of office and dedicated research space, of which only a portion consists of wet lab facilities handling liquids, biological matter, and chemicals. In addition to the office and research spaces, these facilities may also include animal research, warehouse, and manufacturing components. The mix of spaces is dependent on specific tenant requirements related to both the area of research and, for private companies, the stage of the company.

In addition, as the Federal government classifies bioscience research facilities on a Biosafety Level scale of 1 to 4 (BSL 1 – BSL 4), based upon the nature of and potential risks associated with the activity conducted within a building. A more detailed explanation of this classification system, along with discussion of applicable regulatory and oversight entities, is found in Section 6 of this report.

As noted above, this Subcommittee recommends Brookline consider allowing new bioscience laboratory development only of facilities that are either Biosafety Level 1 or Biosafety Level 2.

ADDITIONAL CURRENT MARKET CONSIDERATIONS

Most market observers concur that the current (2021) boom in existing and planned life science building construction is likely to experience a pause in the relatively near future. Classic signs of froth, including pure speculative development, are evident in broad market activity. However, despite the possibility of short-term disruptions, all observers believe that the Boston metro area will always be a major and important market for the life sciences industry, and therefore a viable market for investment in and development and or redevelopment of properties that address the needs of the tenant universe.

Municipalities seeking to participate in this market will increasingly need to 'be ready' given the long lead times property development requires and because both developers and tenants (who typically are the drivers behind new construction) place a premium on *certainty and predictable timing*. Translated, that means that potential users will gravitate to municipalities that have the following characteristics:

1. In place zoning rules for life science projects, even if most development/redevelopment requires special permits to move forward.
2. An in-place public health and safety oversight framework that informs developers and tenants how their anticipated operations in the newly developed facilities would be licensed and monitored by local officials.

While 1 and 2 above are prerequisites for a municipality to 'compete', developers and prospective tenants will also evaluate municipalities based on additional factors such as:

3. Evidence of general community consensus that new laboratory/life science uses would be welcome in the municipality.
4. Indicia of locational attractiveness based on characteristics such as location, transportation, infrastructure, expansion possibilities, community amenities, trained workforce, etc.

WHERE DOES BROOKLINE FIT?

Brookline has some unique characteristics that make it an extremely attractive opportunity at certain select locations, and simultaneously a risky opportunity for life science tenants and real estate investors.

CHALLENGES: There are two primary challenges to Brookline's active participation in the metro-area life sciences market:

The first, and most critical, is the lack in Brookline of the appropriate zoning and public health oversight framework that would provide potential developers, investors, and users sufficiently predictable and transparent processes governing development and operation of life science uses. Brookline lags virtually every adjacent or nearby community in this respect. This fact is reflected in rankings published by the Massachusetts Biotechnology Council, a life science

industry trade group. It presently rates Brookline Bronze, the lowest rating available, in its **BioReady Community Rankings** review of 84 Massachusetts towns and cities. [8]

The experienced laboratory and life science developers and brokers consulted by the Subcommittee uniformly stressed that a prerequisite to serious consideration of Brookline locations by developers and potential new users is the *completion* of the necessary Town Meeting zoning actions to foster laboratory/ life science uses. Similar efforts in recent years by several of Brookline's peer communities, such as Newton and Watertown, have helpfully clarified definitions of allowed research and development uses, provided well-organized special permit processes with predictable timing for development projects, and enhanced tenant-specific public health and safety oversight as a process separate from land use permitting. Our sources were confident that if Brookline were to take similar steps, the Town would be well positioned to compete for and to benefit from growth in this industry.

The second issue is the small number of locations in Town that have the requisite size and dimensions industry experts currently indicate is required for "wet labs". While end users today are typically looking for floor plates of 30,000 to 40,000 square feet, the market is dynamic, and there are potential developments trying to attract interest outside of those sizes. Our market sources identified sites at 10 Brookline Place and portions of the Chestnut Hill West corridor, specifically, Chestnut Hill Office Park, as very promising locations for new laboratory and life science uses. Opportunities for the conversion of existing properties to life science uses also appear limited. It is however possible that other sites in Brookline could offer opportunities. For example, parcels currently owned by not-for-profit entities with sufficient space for larger buildings might become available in the future; and smaller sites might offer the opportunity for incubator space or other "dry" research uses that may not need the same configuration as large office and laboratory uses.

POSITIVES: Because of its proximity to the Longwood Medical Area (LMA), Brookline has long been a viable location for both administrative and medical uses that have supported the operations of the LMA's major (mostly tax-exempt) institutions and is a desirable residential community for many life science workers and investors.

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[8] See Massachusetts Biotechnology Council, https://www.massbio.org/initiatives/bioready-communities/.

The Route 9 Corridor from Brookline Avenue to the Newton line is already an established market for clinical outpatient and institutional office uses. This location is valued because of its closeness to the LMA, its access to Metro West communities and the greater Boston area provided by Route 9's connections to Route 128 and the Massachusetts Turnpike, and the Town's excellent access to public transportation. Brookline is serviced by the Green Line, MBTA bus route 66, which connects Brookline Village to Harvard Square, and MBTA bus route 51 which connects Forest Hills to Cleveland Circle. This well-developed transportation network provides important access for employees and patients/customers alike.

Though Boston University is not currently a meaningful generator of demand for private research and life science space, Brookline's proximity to BU may also be a future factor in investors' interest in Brookline's location.

SECTION 5: POTENTIAL IMPACTS ON THE COMMUNITY

Life Science Research uses are economic development drivers, generating both taxes and jobs coveted by peer communities.

NET FISCAL IMPACTS: NEW COMMERCIAL TAX GROWTH VS. INCREMENTAL COSTS

Currently available laboratory spaces are averaging rents in the Boston market of just under $100 per square foot triple net[9]. Kendall Square is the market leader with rents now well over $100 per square foot. Fenway, with both institutional and venture-backed users, is believed to be the most comparable sub-market to Brookline Village given its own proximity to the LMA and urban construction costs. Fenway rents have recently exceeded $100 for new construction, about equal to Allston and slightly more than other Boston sub-markets such as the Seaport

[9] Cushman & Wakefield, LIFE SCIENCES ON THE RISE, page 20.

Recent investment sales for life-science buildings are exceeding $1000 per square foot [10]. Projected rents for potential Brookline Village life science developments approximate $95 per square foot. These financial metrics, using the Brookline Assessor's approach to valuation, should translate into very high assessed values for this property type, and therefore considerably higher real estate taxes per square foot than retail, hotel, medical office, or traditional office development. This opportunity for high value per square foot expansion of the Town's tax base would help Brookline to address its ongoing structural deficit while mitigating the increase in the tax burden on residential taxpayers.

The costs to the Town associated with this type of property are expected to be minimal. The licensing and regulatory structure proposed in Section 7 of this report, contemplates building developers and the life science users paying licensing fees to defray the administrative and inspectional service expenses, as well as the pass-through cost of consultants the Town may retain to assist in review of license applications and on-going monitoring. Because of these factors, the Subcommittee has a high degree of confidence that laboratory and research use will have a significant positive net fiscal impact.

Life science developments would also have an economic multiplier effect on the local business community. The addition of well compensated employees in the Town's existing commercial areas, many of whom work long hours, would support nearby small businesses and restaurants. In addition, the collaborative nature of science may generate additional demand for the Town's hotels, which will have the further benefit of paying room occupancy taxes.

POTENTIAL OWNERSHIP BY TAX-EXEMPT INSTITUTIONS

Institutional demand is a key driver to the area's life science market, with some institutions renting and others owning. Especially for commercial parcels near the LMA and Boston University, there is a risk of a change of ownership to tax-exempt institutions. When that

[10] Cushman & Wakefield, LIFE SCIENCES ON THE RISE, page 21.

occurs, the taxes previously attributable to these properties are transferred to the remaining commercial and residential property taxpayers in Brookline. This transfer is offset in part if these tax-exempt owners voluntarily agree to make a Payment In Lieu of Taxes (PILOT) payment, typically equal to 25% of the taxes owed.

The Town has utilized over the last decade a tax certainty structure to protect large commercial assets with the potential for tax-exempt ownership from later going off the tax rolls following initial development or redevelopment. Developers seeking zoning changes agree to a recorded, long-term tax certainty PILOT agreement, requiring any future tax-exempt owner to make payments based on 100% of assessed value. However, once zoning is in place, tax certainty agreements cannot be negotiated, as it would be considered "contract zoning" which is illegal in Massachusetts.

In particular, the "wet lab" life science zoning uses recommended in this report may attract institutional owners. Notwithstanding the Subcommittee's recommendation for a new zoning definition to provide for this use, all the potential sites identified by this committee will require significant re-zoning for building form parameters, thereby providing the opportunity to negotiate tax certainty agreements. The Subcommittee recommends continuing this strategy for large new developments having the potential for tax-exempt ownership.

JOB CREATION

While many life science positions are filled by highly educated scientists, there are entry level positions available at both the laboratory and administrative levels for office workers and lab technicians, glasswashers, animal care technicians, as well as for building level functions such as custodial, maintenance, security, parking attendants, cafe workers, landscapers, etc. For past developments, Brookline has negotiated a requirement for developers to provide job fairs and internship opportunities targeted to Brookline residents.

KEY DESIGN FEATURES - SEE APPENDIX 4

QUALITY OF LIFE – WHAT KIND OF NEIGHBOR

Traffic and Parking

The ratio of workers in a life science building per thousand square feet tends to be among the lowest of commercial uses. Depending on the tenant and the mix of lab and office space within the building, a rule of thumb is 2.5 to 3.3 employees per thousand. Unlike a traditional office building user, research is often conducted 24 hours per day, seven days a week. So, while there are core hours where a majority of workers will be present, in general workers' hours do not conform to usual office commuting patterns.

Since laboratory uses tend to have a lower density of persons per square foot of space compared to office uses, that generally translates into less parking and lower traffic impacts. This is reflected in The Institute of Transportation Engineers (ITE) published generation data for R & D compared to office space. As noted above, rush hour traffic impacts are generally not as great due to the 24-hour operations of many labs and the atypical commuting patterns. In addition, many of the younger people in this field seek alternative forms of transportation, including walking, biking, ride shares and public transit. Parking requirements in Boston are 0.7 spaces per thousand square feet, in Somerville 0.9 spaces, and in Watertown 1.5-2 spaces. In more suburban developments, parking is generally free and approach ratios of 4 spaces per thousand square feet. Depending on the location of a development in Brookline, transit access, as well as parking charges in developments east of Cypress Street, may serve to further reduce onsite parking demand.

Noise and odors

The Subcommittee consulted both developers and officials from neighboring municipalities about the extent to which laboratory buildings pose concerns regarding noise and odors. Research and lab buildings are highly engineered and regulated facilities that incorporate extensive controls for potential noise and exhaust. (More information on design requirements for these facilities is found in Appendices 4 and 5.) Due to the need to maintain precise conditions for the proper operation of highly sensitive equipment, and so as to ensure the health and safety of employees, neighbors and the general public, there are highly specialized requirements for the heating and ventilation systems in these buildings. The systems require significant rooftop mechanical equipment, which is typically housed in fully enclosed, acoustically insulated penthouses that meet applicable state and local noise standards.

Further, as in other municipalities hosting these uses, the Town's Building Department would be actively involved in responding to complaints and any necessary regulatory enforcement to ensure that laboratory building operations do not adversely impact neighbors or the public.

SECTION 6: PUBLIC HEALTH & SAFETY

Communities hosting new life science laboratory and research facilities have considered and found various ways to address concerns about the public health and safety aspects of the work of these facilities.

It is important to note that research and development laboratory uses encompass a range of potential activities, only some of which will be in the life sciences. Further, within the life sciences, potential users could be "wet" labs, "dry" labs, or a combination of the two. Wet labs are for manipulating liquids, biological matter, and chemicals. Dry labs are focused on computation, physics, and engineering. (A further discussion of wet vs dry labs can be found here.) The public tends to equate life science research with wet labs, but in fact a portion of life science research space in the Boston market is classified as dry lab space.

The subset of life science lab facilities which may employ biological agents, human and animal cell lines, recombinant DNA (rDNA), toxic chemicals, radioactive materials, or other materials which may pose a hazard to humans are extensively and comprehensively regulated at the Federal and state levels. Such laboratories must comply with the relevant and most recent National Institutes of Health (NIH) Guidelines for research; the most recent biosafety levels and containment measures in the Centers for Disease Control and Prevention (CDC's) *Biosafety in Microbiological and Biomedical Laboratories* (BMBL); the regulations of the Occupational Health and Safety Administration (OSHA) and the US Department of Agriculture (USDA); and all applicable state of Massachusetts regulations. These regulations and standards require such facilities to maintain a safe lab environment for workers and to contain anything potentially hazardous in order to prevent potential risks to employees or the public. The applicable regulations and guidelines provide standards for facility design, facility operations, public safety infrastructure, as well as regulating the actual research activities housed in these facilities.

A partial list of regulatory and standard-setting organizations, including non-governmental organizations, can be found in Appendix 5.

The NIH Guidelines specify the biosafety practices and containment principles for rDNA, synthetic nucleic acid molecules, and cells, organisms and viruses containing such molecules. The CDC's *Biosafety in Microbiological and Biomedical Laboratories (BMBL) 6th Edition* details "best practices for the safe conduct of work in biomedical and clinical laboratories from a biosafety perspective."[11] The BMBL also establishes four levels of Animal Biosafety Laboratories (ABSL) for activities involving hazardous biological work with animals. Dedicated animal research spaces are required for the housing and care of laboratory animals, all of which is strictly controlled under the BMBL, the USDA, and other animal welfare regulations. The USDA regulates research laboratory practices affecting the welfare of a range of animal species used in research, including but not limited to dogs, cats, hamsters, guinea pigs and rabbits. (Certain specified lines of rodents are, however exempt from the primary USDA laboratory animal welfare regulations.)

The BMBL establishes four Biosafety Levels (BSL).

Biosafety Level 1 (BSL-1) is the basic level of protection and is appropriate for defined and characterized strains of ***viable biological agents that are not known to cause disease*** in immunocompetent adult humans. Biosafety Level 2 (BSL-2) is appropriate for handling moderate-risk agents that cause *human disease* of varying severity ***by ingestion or through percutaneous or mucous membrane exposure***. Biosafety Level 3 (BSL-3) is appropriate for agents with a known potential for aerosol transmission, for agents that may cause serious and potentially lethal infections, and/or that are indigenous or exotic in origin. Exotic agents that pose a high individual risk of life-threatening disease by infectious aerosols and for which no treatment is available are restricted to high containment laboratories that meet Biosafety Level 4 (BSL-4) guidelines.[12]

To reiterate, this report recommends only BSL-1 and BSL-2 facilities be permitted in Brookline.

This recommendation is consistent with the views expressed by Brookline's Director of Public Health. Further, the proposed Brookline Biosafety By-law, discussed in detail in Section 7 of this report, would specifically reference and require compliance with all applicable Federal and state regulations by any bioscience laboratory facility operating in Brookline. This is the same

[11] https://www.cdc.gov/labs/BMBL.html

[12] *Biosafety in Microbiological and Biomedical Laboratories, 6th Edition*, Section 1, page 4.

framework used in neighboring municipalities that have adopted local ordinances, by-laws or regulations addressing public health and safety aspects of laboratory uses within their communities.

SECTION 7: REGULATORY FRAMEWORK

As part of its investigation into the potential for new research laboratory and life science development in Brookline, the Subcommittee has developed proposed concepts on how such new uses would be regulated, from both a land use (zoning) and a public health and safety perspective. A fuller description of these proposed concepts is provided in the attached *Laboratory Research Regulatory Concept Outline: Zoning and Public Health and Safety* ("Regulatory Concept Outline"), Appendix 1 to this report.

The **Zoning/Land Use** section of the Regulatory Concept Outline addresses Zoning By-law provisions defining what research laboratory uses would be permitted and in which zoning districts of the Town, subject to special permit requirements and to other applicable provisions of the Brookline Zoning By-law. The **Public Health and Safety** section of the Regulatory Concept Outline includes proposed elements of a new General By-law and associated regulations and procedures addressing how life science laboratories would operate within such permitted laboratory research facilities, providing for Town oversight to ensure that such facilities located in Brookline fully comply with all applicable Federal and state regulations and requirements in a manner that effectively protects public health and safety.

The separation of public health and safety operational aspects from zoning and land use permitting for such facilities allows for careful focus on the typical physical attributes of new building development (parking, traffic, height, setbacks, ground floor uses, storage and loading facilities, and similar issues) during special permit review to authorize the proposed development. Following special permit approvals allowing the development of buildings that include laboratory uses, individual tenant users would be subject to public health and safety licensing and operational oversight as further described below.

Several of the elements in the Regulatory Concept Outline are modeled on zoning definitions and public health frameworks in use in Newton and Watertown, peer municipalities to Brookline that are in the process of developing significant new biotechnology, medical,

engineering, computer science, and related research laboratory business sectors pursuant to recently updated zoning provisions and public health regulations.

ZONING/LAND USE

The Regulatory Concept Outline proposes the following uses be allowed by special permit, in Brookline's Industrial (I), General Business (GB) , Office (O), and General Business and Medical Research (GMR) zoning districts, as well as in existing (Emerald Island Special Overlay District) and/or new Special Overlay Districts.

> **"Research and Development Laboratory**. A facility for scientific or medical research, testing, and prototype development in one or more scientific fields, including, but not limited to, life sciences, biotechnology, biomedical research, robotics, medical devices, or photonics. *Research and Development Laboratory* may include a research laboratory for scientific or medical research with a Biosafety Level of Level 1 or Level 2, as defined by and subject to all applicable requirements of the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Institutes of Health (but shall not include Biosafety Level 3 or higher laboratories)." [13]

In addition to securing the required special permit for this defined use, development projects encompassing Research and Development Laboratory uses would be subject to all other applicable Town of Brookline Zoning By-law requirements. Due to dimensional limitations under present zoning, modified zoning provisions would likely need to be adopted by Town Meeting for any such development or redevelopment to proceed. Such projects would generally constitute major impact projects requiring extensive Town staff review, a neighborhood meeting, and a Design Advisory Team review, prior to the granting of a special

[13] The intent is that this definition should be placed into the Zoning By-law in a way that does not cause any existing similar uses (currently legal) to become pre-existing non-conforming. .

permit. Additionally, special permits will be needed for dimensional relief with respect to mechanical penthouses exceeding 10 feet in height serving this type of use, as required under present Brookline zoning.

PUBLIC HEALTH AND SAFETY

The Regulatory Concept Outline proposes a Town oversight framework based primarily on Watertown's 2020 Biotechnology Regulations[14] governing laboratory work using biologic agents or recombinant DNA (rDNA) technology, with some reference to other municipalities' programs for public health and safety oversight of laboratory uses. The Watertown Regulations have been favorably received by and are being successfully applied within the laboratory development and user communities.

NEW TOWN GENERAL BY-LAW REGARDING BIOSAFETY

Subject to Town Meeting approval, Brookline would adopt a new General By-law to provide a mechanism for Town oversight of those Laboratory and Research Development facilities that work with biologic agents[15] and/or recombinant DNA (rDNA) technology. The purpose of the new By-law would be to provide a framework for the Town to ensure that existing comprehensive Federal and state regulatory requirements for such facilities are fully implemented by research laboratory life science operations located in Brookline in a manner that effectively protects public health and safety.

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[14] https://www.watertown-ma.gov/DocumentCenter/View/28898/Adopted-rDNA--Biosafety-regulaltions-Updated-to-712020

[15] Non- rDNA biologic agents include microorganisms (such as bacteria, viruses, fungi, rickettsiae or protozoa) or infectious substances.

As discussed in Section 6 of this report, all life science laboratories must comply with the relevant and most recent NIH Guidelines for research, the most recent biosafety levels and containment measures in the CDC's Biosafety in Microbiological and Biomedical Laboratories (BMBL), and all applicable state of Massachusetts regulations. Animal testing facilities , which typically comprise a small component of some BSL-1 and BSL-2 laboratories, are also subject to special animal biosafety requirements included in the CDC's BMBL, specialized design codes and operational requirements promulgated by the National Research Council and the U.S. Department of Agriculture and professional industry standards issued by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and the American Association for Accreditation of Laboratory Animal Care (AAALAC).

ESTABLISHMENT OF BROOKLINE BIOSAFETY ADVISORY COUNCIL

Pursuant to the authorizing By-law, a Brookline Biosafety Advisory Council (BBSAC) would be formed, comprised of five (or seven) members, including:

- Advisory Council on Public Health Chair or designee,
- Director of Public Health and Human Services or designee,
- a hazardous materials advisor appointed jointly by the Director of Public Health and Human Services and the Fire Chief, and
- two (or four) Brookline residents with relevant training and experience in the areas of biotechnology, occupational health, infectious disease, and/or environmental health, to be appointed by the Director of Public Health and Human Services and interviewed and confirmed by the Brookline Select Board.

The establishment of such a Biosafety Advisory Council to assist and advise in the administration of Town regulations and oversight of research laboratory/ life science operations in Brookline was specifically endorsed by Brookline's Director of Public Health and Human Services, Dr. Swannie Jett, in discussion with the Subcommittee of potential public

health responses to new life science uses in Brookline[16]. Dr. Jett felt that such an Advisory Council would be helpful in providing transparency and a level of assurance to the community at large that public safety aspects of such operations are being controlled and managed properly.

The Biosafety Advisory Council would advise the Director of Public Health and Human Services, other relevant Town departments including the Building Inspector and Fire Department, and Town consultants, regarding implementation of a registration and licensing program for operators of BSL 1 and 2 laboratories in Brookline, as further described below. The Biosafety Advisory Council would hold public hearings with respect to BSL 2 license applications; make recommendations to the Public Health Director regarding approval or denial of licenses; advise the Public Health Director on the promulgation and periodic modification of Biosafety Regulations and/or policies and procedures to further effective program operations; and would advise the Public Health Director, Building Inspector, and Fire Chief with respect to ongoing oversight and enforcement issues concerning life science laboratory operations.

[16] Dr. Jett attended the Subcommittee meeting on April 27, 2021, at which municipal best practices to address public health and safety aspects of bioscience laboratory uses were discussed in detail.

REGISTRATION PROCESS FOR BSL 1 LABORATORIES

BSL 1 laboratories, and low-risk laboratories that are otherwise exempt from NIH guidelines, would register annually with the Public Health Department and pay an annual registration fee. They would be subject to periodic inspection by Town staff or consultants.

LICENSING PROCESS FOR BSL 2 LABORATORIES

Operators of BSL 2 laboratories would be required to obtain a license to operate from the Public Health Director. Licenses would be approved for a one-year term and would be renewable annually for four additional successive one-year terms. After five years, a full new application would need to be submitted to obtain a new license.

APPLICATION PROCEDURES. A completed application, with required supporting materials, would be submitted to the Director of Public Health and Human Services. Application information would include, e.g.: plot and floorplans, lists of organisms with associated containment levels and decontamination procedures, plans to test purity of host organisms and resistance to commonly used antibiotics, waste management and pest control plans, and safety manuals.

License applicants would consent to inspection of facilities and records by Brookline employees or Town consultants. A license applicant would commit to include on its Federally required Institutional Biosafety Committee at least one community representative from Brookline.

Staff or a consultant working on behalf of the Public Health Department would review the inspection report and application to create a summary for the Director of Public Health and the Biosafety Advisory Council. Input from the Building Inspection Department and the Fire Department would be sought as applicable and would be included in the summary.

The Biosafety Advisory Council would hold a public hearing to include a presentation by the license applicant, a review of the summary report, and public comment. The Biosafety Advisory Council would then make a recommendation whether the Director of Public Health should approve license issuance.

LICENSE TERMS AND RENEWALS. New license issuance after five years would be based on a new full application and would be governed by the then-current Brookline Biosafety Regulations and any related guidelines and processes. The re-issuance application would include description of any changes, or certification that no changes have occurred since the prior license approval, along with a description of current protocols and any physical improvements at the facility.

FEES AND REIMBURSEMENTS FOR SPECIALIZED PEER REVIEWS. Application and renewal fees would support a portion of the expenses of program operation, including employment of appropriate staff and consultants to conduct application review, inspections, and enforcement. At the request of the Biosafety Advisory Council or on recommendation of the Director of Public Health and Human Services, Building Inspector, or Fire Chief, where a particular application warrants additional specialized expertise for peer review, the Town would retain a consultant expert whose fees would be reimbursed by the applicant.

SECTION 8: TOWN RESOURCES AND ALIGNMENT WITH EXISTING PRIORITIES

ALIGNMENT WITH BROOKLINE'S SUSTAINABILITY COMMITMENTS

In both the Fall 2019 and Spring 2021 Town Meetings, Warrant Articles were passed restricting the use of natural gas in new construction. Under both warrant articles, laboratory uses were exempted from this prohibition on natural gas use. As described in Appendix 4 and in this report, there are stringent regulations governing the specifications for air handling and other mechanical systems which, as of this writing, make it infeasible for such systems to be fossil fuel free (FFF). The technology in this area is rapidly evolving however, and the Subcommittee has heard optimistic reports that FFF life science facilities will become possible in the next three to five years. Requirements for future projects to be both FFF and for electric car infrastructure should be addressed when negotiating project-specific zoning changes.

IMPACTS ON BROOKLINE'S EXISTING INFRASTRUCTURE AND OPERATIONS

State codes regulate the discharge of wastewater into public sewers. Brookline is a member of the MWRA, and water and sewer usage is regulated by the MWRA, rather than Brookline's Water and Sewer Department. Regardless of the Biosafety Lab level, all life science labs are

required to receive and maintain an industrial use sewer discharge permit, which may be conditioned on pre-treatment of the discharge. The level of permit is determined by the MWRA based on the permit holder's operations, the volume of the daily discharge, and the potential for pollutants. The MWRA inspects the facility prior to issuing a permit and then at regular intervals during the life of the permit. The permit holder must submit wastewater samples to the MWRA, with the frequency of the submission dependent on the type of permit but ranges from once every five years to monthly. In addition, the MWRA collects its own samples directly from the facility.

The Building Department is not aware of any specific building code requirements which would necessitate any periodic inspections for this use. Feedback from other municipalities indicates building departments are most often involved in "nuisance" issues related to noise or late-night lights. Dan Bennett, Brookline's Building Commissioner, considers these typical issues the department deals with across property types.

The amounts of certain flammable liquids and other hazardous materials which may be used in a building and the specifics of under what conditions they may be stored (i.e., specific fire suppression systems), is regulated by the state building code. Beyond certain exempt amounts, the state building code also specifies in the instance of certain "High Hazard Use" substances the "fire separation distance" between the building's perimeter and adjacent lot lines, public ways, and neighboring structures. These requirements may exceed setbacks required under local zoning. [17]

The Fire Department anticipates it will be involved in unspecified emergency medical responses, as 60% of its calls are currently with EMS crews (who should we call, the Fire Department). They do not anticipate fire specific regulations beyond existing building and fire codes. Using and storing hazardous materials above the 7th floor is permitted so long as the quantities are within the code limits. The Department recommends that fire safety training specific to lab use be provided. Additionally, at the time of permitting, the Department recommends the Town hire a third party code review consultant specifically for lab uses.

[17] *Microbes, Mice and Minefields: Unique Issues in Developing and leasing Life Science Facilities,* by William R. O'Reilly, Jr., page 5 (full citation in Appendix 3).

APPENDIX 1 LABORATORY RESEARCH REGULATORY CONCEPT OUTLINE

Laboratory Research Regulatory Concept Outline

Zoning and Public Health and Safety

Zoning/Land Use: Defines the permitted use and where in Town it will be allowed.

1. **Proposed Zoning Use Definition**:

"Research and Development Laboratory. A facility for scientific or medical research, testing, and prototype development in one or more scientific fields, including, but not limited to, life sciences, biotechnology, biomedical research, robotics, medical devices, or photonics. *Research and Development Laboratory* may include a research laboratory for scientific or medical research with a Biosafety Level of Level 1 or Level 2, as defined by and subject to all applicable requirements of the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and National Institutes of Health (but shall not include Biosafety Level 3 or higher laboratories)."[18]

2. **Permitted Locations (Subject to Special Permit):**

The defined Research and Development Laboratory use would be allowed, subject to a required special permit, in Industrial, General Business, Office, and General Business and Medical Research Districts, plus applicable existing (Emerald Island Special Overlay District) and/or new Special Overlay Districts.

[18] The intent is that this definition should be placed into the Zoning By-law in a way that does not cause existing similar currently-legal uses to become preexisting non-conforming. The Subcommittee is continuing to consult with Town Counsel, the Building Commissioner, and Planning Department staff on how best to achieve this intent.

3. **Other Applicable Provisions under Existing Brookline Zoning Bylaw**

   In addition to the required special permit for this use as noted above, any development of this defined Research and Development Laboratory use will be subject to all other applicable Brookline Zoning By-law requirements. Due to dimensional limitations under present zoning, modified zoning provisions would likely be needed to be adopted by Town Meeting for any such development or redevelopment to proceed. Such projects would constitute a Major Impact Project requiring extensive internal staff review, a neighborhood meeting and a Design Advisory Team review prior to the granting of a special permit. Additionally, special permits will be needed for mechanical penthouses in excess of 10 feet serving this type of use, as required under present zoning.

Public Health and Safety Regulations: govern how laboratory uses operate within permitted laboratory research facilities

Proposed New Biosafety General By-law

1. **Purpose:**
   - **a.** To provide a process for Town oversight of those Laboratory and Research Development facilities that work with biologic agents and/or recombinant DNA (rDNA) technology.
   - **b.** Operation of life science laboratories and any associated animal research component must maintain compliance with NIH Guidelines for research, the CDC's Biosafety in Microbiological and Biomedical Laboratories (BMBL); with all applicable state of Massachusetts regulations; and with specialized design codes and operational requirements promulgated by ASHRAE, the National Research Council, and the U.S. Department of Agriculture for animal research.

c. The By-law would restrict life science laboratories operating in Brookline from using warm-blooded "animals", as that term is defined in the USDA Animal Welfare Regulations. [19]

2. Scope:

a. All life science laboratories.

3. Oversight Mechanisms

a. Establishment of a Brookline Biosafety Advisory Council (BBSAC) to advise the Director of Public Health and Human Services (the "Director").

i. Size: 5 or 7 members consisting of

1. Advisory Council on Public Health Chair or designee,

2. Director or designee,

3. Hazardous materials advisor appointed jointly by the Director and the Fire Chief, and

4. Two (or four) Brookline residents with relevant training and experience in the areas of biotechnology, occupational health, infectious disease, and/or environmental health. To be appointed by the Director and interviewed and confirmed by the Brookline Select Board.

ii. Authority and Responsibilities of BBSAC and Director

1. Licensing:

a. BBSAC conducts public hearings with respect to applications for BSL-2 licenses.

b. Upon review of a BSL-2 license application, in collaboration with the relevant Town staff and Town consultant reports and the completion of the required public hearing, BBSAC makes a recommendation to the Director regarding the

[19] "Animals" are defined in the Animal Welfare Regulations as any warm-blooded animals. The defined term specifically excludes birds, and specifically excludes rats of the genus Rattus and mice of the genus Mus that are bred for use in research. 9 CFR 1.1 – Definition of Terms

Director's issuance or denial of the requested BSL-2 license.

2. Regulations and Policies:

a. The BBSAC would advise the Director on the promulgation of Biosafety Regulations setting forth detailed procedures and standards for registration and licensing.

b. The BBSAC would periodically review the appropriateness and effectiveness of any Biosafety Regulations established under the Bylaw, would recommend modifications to the Regulations, and would advise the Director, Building Inspector, and Fire Chief with respect to ongoing oversight and enforcement issues concerning life science laboratory operations.

c. The BBSAC may advise the Director on other policies and procedures consistent with the Regulations to further effective program operation.

4. **Registration and Licensing**

a. Registration

i. Required for BSL 1 laboratories and those laboratories that are exempt from NIH Guidelines.

ii. Annual requirement

iii. Fee schedule to be established by Director.

iv. Registration submission requirements to be recommended by BBSAC and established by the Director in conjunction with other appropriate Town Departments.

v. Registering operations consent to inspections by appropriate Town authorities.

b. Licensing

i. Required for BSL 2 laboratories.

ii. Schedule:

1. One-year term renewable annually for four additional successive one-year terms.

2. Full license re-issuance required after five years, requiring submission of a new application.

iii. Applications:

1. Form to be established by Director in consultation with BBSAC.

2. Application materials to include, but not be limited to: plot and floor plans, lists of organisms with associated containment levels and decontamination procedures, plans to test purity of host organisms and resistance to commonly used antibiotics, waste management and pest control plans, and safety manuals.

iv. Licensing conditions to include but not be limited to:

1. Consent to inspection of facilities and records by Town employees or consultants.
2. Establishment of an Institutional Biosafety Committee (IBC), if not already required under other Federal or state regulations. All IBCs shall include one or more community representatives.
3. Payment of application and renewal fees as may be established from time to time by the Town, and reimbursement to the Town of the cost of any consultants whose expertise is required in the review of applicant's license application.
4. Animal research components of life science laboratories will be required to secure accreditation from the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC International) .
5. Such other conditions as may be established by the Director in conjunction with BBSAC and other relevant Town officials.
6. Public hearing to be conducted by BBSAC to obtain community input prior to initial license approval and every 5 years upon relicensing.

APPENDIX 2 SUBCOMMITTEE CHARGE AND MEMBERS

Subcommittee Charge

Established in February 2021 by the Economic Development Advisory Board, to investigate and evaluate the addition of Research and Development and/or Laboratory Life Science and other related uses to the Brookline Zoning By-Law beyond the present GMR district at Brookline Place.

The ad hoc subcommittee will research market, design, safety, zoning, licensing, monitoring, financial, infrastructure and transportation requirements, community impacts and acceptance and other considerations germane to the topic. This work will be done in coordination with other ongoing or future planning efforts. The ad hoc subcommittee will endeavor to provide a draft report with preliminary recommendations to EDAB.

Specific discussion points to include:

- Review potential contacts and rough sequencing of topics to be investigated;
- How will community impacts and acceptance be determined;
- How will potential redevelopment sites be determined and are there any existing

buildings that could be converted; and

- Recurring schedule for future meetings, recognizing need for flexibility for some

industry guests.

- Potential roles (note taking, collecting relevant media articles, etc.)

Subcommittee Study Process

The Subcommittee held 14 public meetings, and EDAB convened a widely noticed public hearing on September 29, 2021, at which feedback was provided on our findings and recommendations. The Subcommittee met with developers, brokers, and peer municipal officials, as well as Town staff.

The Subcommittee developed the findings and recommendations discussed in this report based on consultation with a range of industry experts (as detailed in Appendix 3) and specific consultation with Brookline's Director of Public Health and Human Services, Town Counsel's

Office, and other key Town officials (Fire Chief, Building Commissioner, and Planning Department staff). The Subcommittee also investigated the regulatory and other best practices of other Greater Boston municipalities either well-established in hosting laboratory/life sciences development and operations (e.g., Boston and Cambridge) or emerging in recent years as active and successful in providing for these types of uses (e.g., Somerville, Newton and Watertown.) Finally, Subcommittee members networked with some of the many Brookline residents who are life science professionals.

Subcommittee Members

Cliff Brown: Cliff Brown is a Town Meeting Member (Precinct 14) and member of the Advisory Committee where he is the current chair of the Schools Subcommittee. He serves or has served on the Economic Development Advisory Board, The Zoning By-Law Committee, the 2014 and 2017 Override Study Committees and the 111 Cypress Acquisition Committee and has assisted the Public Schools of Brookline superintendent's office with enrollment projections. He was the co-chair of the Runkle site-council and coached Brookline youth and travel soccer teams. His professional background is in investment banking and investment management with a particular focus on real estate. He has a B.S. in Economics and an M.B.A. in Finance from The Wharton School of the University of Pennsylvania. He and his wife Lisa Halpert have lived in Brookline for 24 years and their three children attended the Brookline Public Schools

Carol Levin: Carol Levin is a member of the Advisory Committee and the Economic Development Advisory Board. She is a member of the Pierce Building Committee and was also a member of the 2014 Override Study Committee, the 111 Cypress Street Acquisition Committee, the Treasurer of the Runkle PTO and a member of the BHS PTO Board. Carol is the Founder and Principal of RE-Advisors, New England's first healthcare real estate consulting firm where for over 25 years she has guided healthcare organizations in thinking strategically about real estate. Prior to RE-Advisors, she spent over a decade in the field of commercial real estate finance. She holds both a BS and an MBA from Cornell University. She and her husband Dr. Jeffrey Macklis have lived in Brookline for 30 years and their two children attended Runkle and Brookline High School.

Marilyn Newman: Marilyn Newman is a member of the Economic Development Advisory Board. She has served on Town study committees addressing redevelopment at the Waldo-

Durgin site and new zoning for the Emerald Island special district. She is an environmental attorney practicing with the Boston law firm Mintz, focusing on permitting and planning of real estate, infrastructure, transportation and renewable energy projects. Prior to joining Mintz, Marilyn served as chief counsel to the Massachusetts state transportation department and in other senior public agency legal positions. She holds a BA degree from Harvard College and a JD degree from Harvard Law School. She and her husband Francis Ganong have lived in Brookline for more than 35 years, and their two children graduated from Brookline High School.

Paul Saner: Paul Saner is a Town Meeting Member (Precinct 13) and is co-chair of Brookline's Economic Development Advisory Board. Paul also serves, or has served, on the Zoning By-Law Committee, the Housing Opportunities Task Force, the Moderator's Committee on Tax Classification, the Community Preservation Review Committee, the Fisher Hill Study Committee and several other project review committees. He was a principal of a national real estate investment firm and a Managing Director of a major commercial bank. He was the founding board chair of the Metropolitan Waterworks Museum and was the Governor appointed Commissioner of the Massachusetts Commission for the Blind. He was a Trustee of the Brookline Community Foundation, served on the Runkle School Council, and was President of Friends of Brookline Rowing. He has a BA from Trinity College and holds an MBA in Finance from the University of Rochester. He has lived in Town for more than 33 years, and his daughters were graduates of Brookline public schools.

APPENDIX 3 RESOURCES

Members of the Committee and/or Economic Development staff met or spoke with the following. Individuals with whom the Committee and staff met with in a public meeting are noted by an *.

*Berkeley Investments - Young Park, Samantha Kaufman and Morgan Pierson

Daniel Bennett, Brookline Building Commissioner

*Bulfinch Company - Robert Schlager, Matt DeNoble, Mark DiOrio, Brian McInerney, Pamela Yang, and Valon Hidra[20]

George Cole, Leggatt McCall Properties

Brookline Fire Department Staff including Fire Chief John F. Sullivan, Deputy Chief David A. Randolph, Captain Todd Cantor, Emergency Management Coordinator Cheryl Snyder, First Responders and HazMat

*Duncan Gratton, Executive Director of agency leasing brokerage - Cushman & Wakefield

Tom Galligani, Somerville Economic Development Director

Jesse Gray, PhD Ascidian Therapeutics Director and Group Leader

*Jessica Healey, Environmental Health & Engineering, Inc.

*Dr. Swannie Jett, Director of Brookline Public Health Department

*Steve Magoon, Director of Planning and Assistant Town Administrator, Watertown

Patricia Maher, Chair Brookline Advisory Council on Public Health

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[20] Bulfinch Companies is the owner of 10 Brookline Place. While the meeting with the Subcommittee was general in nature, in the spring of 2021 Bulfinch also presented massing concept plans to the Boylston Street Study Committee for the redevelopment of 10 Brookline Place as a life science building.

Subcommittee Report – 10/04/21

Pam McKinney, Byrne McKinney & Associates

*Frank Nelson, Executive Managing Director of Medical – Academic Practice – Newmark

Philip Plottel, Chair Newton Economic Development Commission

Jonathan Simpson, Associate Brookline Town Counsel

*Ted Tye, National Development

Carrie Wager, PhD Ascidian Therapeutics Vice President Strategic and Scientific Operations

Henry Warren, V.M.D. Associate Director for Harvard's Veterinary and Diagnostic Services for the Animal Resource Center

Amanda Zimmerman, PhD Axonis Associate Director, Neuroscience Discovery and Preclinical Development

WRITTEN RESOURCES

Lab and Life Science Market Reports from:

Avison Young

Colliers

CBRE Research

Cushman & Wakefield: Life Sciences on the Rise, North American Report 2021

Newmark

MICROBES, MICE AND MINEFIELDS: UNIQUE ISSUES IN DEVELOPING AND LEASING LIFE SCIENCE FACILITIES. William R. O'Reilly, Jr., Wilmer Cutler Pickering Hale and Dorr, LLP. American College of Real Estate Lawyers, October 2014

NIH RePorter – Data on NIH Funding

Fire Safety Resources:

https://coderedconsultants.com/insights/did-you-know-nfpa-45-is-adopted-for-lab-projects-in-the-city-of-boston/

https://coderedconsultants.com/insights/statewide-adoption-of-nfpa-45-for-laboratories/

https://coderedconsultants.com/insights/chemical-compliance-options-for-multi-tenant-lab-and-manufacturing-buildings/

https://coderedconsultants.com/insights/chemical-room-storage-considerations/

APPENDIX 4 KEY DESIGN FEATURES

The engineering of a life science building, including Environmental, Health, and Safety consultants, is critical to its success. There are considerable infrastructure costs, which require minimum building mass for financial feasibility.

Life science uses require higher floor to ceiling height than an office building, and higher rooftop penthouses for mechanical equipment. Generally, floor to ceiling heights are in the 15-foot range to accommodate ducting, with a 20-35 foot-high mechanical penthouse enclosed to mitigate noise that makes mounting rooftop solar panels challenging. Laboratories using hazardous materials require 100 percent outside air. This is achieved by at least 6 air changes per hour providing continuous ventilation. The significant venting of fume hoods and increased air handling IS MUCH DIFFERENT THAN an office building which tries to stay as tight as possible.

Another key design consideration is future flexibility. There are many unique physical features of life science space, including dry labs and wet labs along with research support space for many specialized functions in addition to more general office space. For start-up labs in particular, flexibility is needed between the amount of research and office space as the life cycle of the company evolves. Ideally a lab can be converted from the production of hazardous waste to a highly sterile place. Vibration along the Green Line must be mitigated. the first floor must work well for loading docks, trash, and chemical storage, all ideally inside the building. Labs require 2 independent power feeds with a backup generator. Vivarium (animal housing) have dedicated elevators and are segregated from other lab and associated office spaces. This is an important building feature, and while small in size is Very expensive to construct

There are a number of factors which make conversion of existing structures to life science facilities challenging including fire safety and building code in addition to high venting, rooftop mechanical, emergency power, and utility demands. Brookline has no obvious large buildings that could be converted to this use.

APPENDIX 5 REGULATORY AND STANDARD SETTING ORGANIZATIONS

The following is a partial list of the regulatory and standard setting organizations governing the design, construction, and operation of life science facilities.

The Centers for Disease Control and Prevention's *Biosafety in Microbiological and Biomedical Laboratories (BMBL) 6th Edition*

Massachusetts Department of Environmental Protection (MASS DEP) Environmental Compliance for Laboratories

The National Institutes of Health, Office of Science Policy: Biosafety Guidance and Resources

The National Institutes of Health, Division of Technical Resources: Design Requirements Manual

NIH GUIDELINES FOR RESEARCH INVOLVING RECOMBINANT OR SYNTHETIC NUCLEIC ACID MOLECULES (NIH GUIDELINES)

National Institute of Building Sciences **Whole Building Design Guide,**

Dry Labs

Wet Labs

US Department of Labor, Occupational Safety and Health Administration

USDA Animal Care